ESTIMATION OF 24 HOURS PROTEINURIA : COMPARISON OF TWO METHODS

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SUMMARY

Quantitative estimation of proteinuria, using a random urine sample is compared with the 24 hour estimation, in normal and in patients of Non-Insulin Dependent Diabetes Mellitus (NIDDM). It is found that calculation based on the protein/creatinine ratio (P/C ratio) in a random sample of urine gives a reliable index of the protein excretion per day especially if the proteinuria is not very severe. The P/C ratio in normal individuals ranged from 0.02 to 0.2, with a mean value of 0.07 ± 0.04. The expected protein excretion calculated based on the protein and creatinine values gave good correlation with the actual values obtained using 24 hour urine collection. The correlation co-efficient (r) values were 0.96, 0.86 and 0.74 in groups of patients with proteinuria < 200 mg/day, 201 to 999 mg/day and > 1 gm/day respectively. The advantages of the procedure are that

(a) it can be used as an outpatient procedure and

(b) the cumbersome 24 hour urine collection can be avoided in several patients.

Introduction

Quantitative estimation of proteinuria is usually done by measurement of protein in twenty four hour collections of urine. The procedure is widely used for diagnostic and prognostic purposes. There are several disadvantages of the 24 hour collection procedure. It is cumbersome, involves a lot of time and effort and problems with collection of urine are numerous especially in illiterate patients.

Recently Gensberg et al (1) and Shaw et al (2) reported on the use of a single voided urine sample for quantitative estimations of proteinuria. This involves the calculation of the protein/creatinine ratio (P/C ratio) from a single sample of urine.

We performed a study of protein/creatinine ratios on samples of urine from diabetic patients and compared the values of estimated proteinuria with those obtained by the conventional 24 hour urine collection methods. This paper presents the results of this study.

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Material and Methods

The study covered 30 healthy volunteers with no evidence of any systemic illness or family history of renal disease and one hundred and fifty non-insulin dependent diabetic patients, seen in the M.V. Hospital for Diabetes, Madras. The second sample of urine collected around 8 A.M. after an overnight fast was used for test. The diabetic patients were advised to collect all the urine voided during the next 24 hours after the random sample was obtained. The urine collection was carefully supervised by a laboratory assistant and the ward nurse.

Urinary protein was estimated by the sulphosalicylic acid method and creatinine by the Jaffe's procedure (3). The values were expressed in mg/dl and the protein/creatinine (P/C) ratio was calculated in the random samples. Expected protein excretion in 24 hours was calculated by multiplying the P/C ratio by the formula given below (1, 4) :

For Men

$$\frac{(140 - \text{age in years})\ (\text{weight in kg})}{5000}$$

For Women

$$\frac{(140 - \text{age in years})\ (\text{weight in kg}) \times 0.85}{5000}$$

Patients were divided into three groups based on the 24 hour proteinuria.

Group I Proteinuria < 200 mg/day
Group II Proteinuria 201 to 999 mg/day
Group III Proteinuria 1 gm and above

Correlations between the expected values and the actual values were calculated in each group separately, by standard statistical procedure.

In 20 patients, random samples of urine, collected in the morning and the afternoon, were tested and the results were compared.

Results

The P/C ratios in the normal volunteers ranged from 0.02 to 0.2. Table-1 shows the P/C ratios and the correlation co-efficient (r) between the expected and the actual value for proteinuria in each group of patients.

In all three groups good correlation between the expected and actual protein excretion per day was observed. Group III showed the lowest correlation among the three groups. In this groups, 4 patients showed very poor correlation between the expected and actual values for proteinuria. In two obese, young patients in Group II, the expected values were higher than the actual values.

TABLE — 1

Correlation of the expected proteinuria with 24 hour proteinuria

	P/C Ratio	Mean Proteinuria per day mg/day ± SD		r value Expected value Vs Actual Value
		Expected	Actual	
Controls	0.07 ± 0.04	< 100	< 100	
Group I	0.08 ± 0.05	110 ± 22	106 ± 22	0.96
Group II	0.61 ± 0.42	570 ± 340	482 ± 168	0.86
Group III	2.92 ± 1.86	2620 ± 1650	2658 ± 1011	0.74

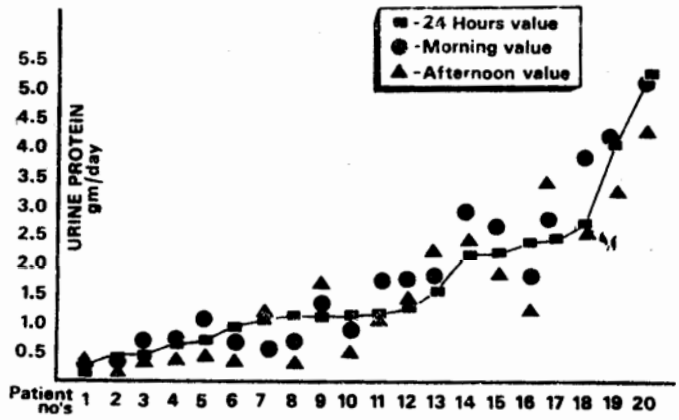

Fig. 1
The relation of the values of estimated proteinuria using P/C ratio in morning and afternoon samples, and the actual proteinuria estimated by testing of 24 hour urine collection.

Comparison between the morning and afternoon samples of urine is shown in Figure-1. It is noted that the afternoon samples of urine gave slightly lower values compared to the morning samples for the expected proteinuria. The mean values estimated from the morning and afternoon urine specimens were 1.92 ± 1.6 gm and 1.62 ± 1.85 gms respectively when the actual 24 hour excretion was 1.87 ± 1.67 gms/day.

Discussion

Estimation of the P/C ratio using a random sample of urine is found to be useful index of the protein excretion in patients with varying grades of proteinuria. There was good correlation in patients with mild to moderate degrees of proteinuria. In patients with severe degree of proteinuria there was some dissociation between the two values. We find that urine samples collected during the day time, both the morning and afternoon samples. give a reliable index of the protein excretion. It has been shown by Shaw et al (2) and Ginsberg et al (1) that an early morning specimen is less reliable than those collected during the day.

This study shows that the P/C ratios by themselves appear to indicate the presence and degree of proteinuria. It can thus be used as a screening procedure even in an out-patient clinic, as it requires only a random urine sample. If this screening test shows value above 1.0 gm/day, 24 hour urine collection can also be performed, if necessary, to quantify the proteinuria.

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